

Eye Protection and Safer Practices FAQ

A safety resource from the National Science Teachers Association

What Is My Obligation?

Science teachers are obligated to provide students with safer and appropriate eye protection. All indirectly vented splash goggles and safety glasses should comply with the ANSI Z87.1-1989, ANSI Z87.1-2003, or ANSI/ISEA Z87.1 D3-2010 standard or whichever standard is currently enforced by the governing local, state, or federal agencies. (Note, while not yet recognized by the Occupational Safety and Health Administration [OSHA] as a “consensus standard” under the PPE 1910.133 eye and face protection standard, this updated resource—ANSI/ISEA Z87.1-2015—should be reviewed for better professional practices.) Only indirectly vented goggles and safety glasses marked with “Z87+” is highly recommended to be purchased for additional eye protection from impact; the “Z87+” mark will appear on the frame or the lens. Note that “Z87+” indicates high-velocity impact, and “Z87” alone means basic impact. School boards as the employer are responsible for purchasing and teachers are responsible for selecting eyewear (based on the employer’s personal protective equipment (PPE) safety plan) that provides themselves, their students, other school employees, and visitors with the most suitable protection for the hazards and associated risks present in school science activities.

[Eye and Face Selection Tool Eye and Face Protection Tool](#)

<https://www.osha.gov/SLTC/etools/eyeandface/ppe/impact.html>

When Is Eye Protection Required?

Eye protection is required for any laboratory or field activity (e.g., setup, hands-on activity, takedown, cleanup, and hand washing). Eye protection is required (but not limited to) when there are biological, chemical and/or physical hazards with resulting assessed risks, such as:

- Working with hazardous biological (e.g., bacteria, etc.), chemical (e.g., corrosives, flammables, etc.), or physical (e.g., glassware, electrical equipment, etc.) materials
- Working with materials or equipment under stress, pressure, or force that might cause fragmentation or flying particles
- Doing an activity that generates projectiles, or uses elastic materials under stress (e.g., springs, wires, rubber, glass) or causes collisions
- Creating dust or fumes
- Working with thermal hazards or heating sources (e.g., Bunsen burner, hot plate, etc.)

- Using preserved or live specimens
- Working with metersticks or other lever systems

Appropriate safety action like selecting and using eye protection must be accompanied by adequate instruction on the hazards of the particular activity (hazards analysis) and of the precautions to be followed to reduce the risk of injury (risk assessment).

What Is the Best Eye Protection for Science Investigations?

Z87+ D3 safety glasses with side shields or directly vented goggles can provide adequate protection for laboratory or field activities involving solid materials, fragmentation, elastic materials, collisions, or projectiles.

Indirectly vented, chemical-splash goggles, Z87 + D3, should be the standard eye protection when using chemicals (solids and liquids), glassware, heating sources, preserved specimens, or dust/solid particles. An indirectly vented, chemical-splash goggle should fit snugly on the face surrounding the eyes, and the soft, pliable flange seals should extend around the eye. Since goggles need ventilation to reduce fogging, indirectly vented chemical-splash goggles are required to have hoods or caps over the vent openings to prevent chemical splashes from entering the inside of the goggle and causing injury to the eye.

What Eye Protection Should Be Used With Lasers?

Safer use of lasers in educational institutions such as classrooms, laboratories, lecture halls, science fairs or projects, and laser pointers is guided by ANSI A136.5 and A136.1. Signage is required outside the classroom when lasers are in use. Avoid staring into any laser or viewing directly with optical instruments. Spectacles or goggles with appropriately filtering optics specific to the type of laser can protect the eyes from hazardous reflected light, scattered laser light or direct exposure to a laser beam of Class 1, 1M, 2, 2M, or 3R lasers. A Class 1 laser that is typically used in K–12 settings is generally safe under all conditions of normal use. A Class 1M laser is generally safe for all conditions of use except when passed through magnifying optics such as microscopes and telescopes. A Class 2 laser is considered to be generally safe because of the blink reflex. Some laser pointers and measuring instruments are Class 2 lasers. A Class 2M laser is generally safe because of the blink reflex if not viewed through optical instruments. A Class 3R laser is considered generally safe if handled carefully and with restricted beam viewing. A Class 3B laser should be avoided in K–12 settings because it is hazardous if the eye is exposed directly. A Class 4 laser, typically used by industrial, scientific, military, and medical lasers, can cause permanent eye damage and can burn skin. Before using any type of laser, consult state and local rules and regulations. NOTE: There are currently no marking designations for eye protection to

Lasers in the ANSI/ISEA Z87.1-2015 standard. Refer to ANSI Z136.1-2014 “Safe Use of Lasers,” for guidance in choosing the correct protective eyewear when working with lasers.

[Laser Standards and Classifications](#)

[OSHA Laser Hazards](#)

When Should I Use a Face Shield?

A face shield is a device used to protect the wearer’s entire face from chemical splash, droplets, spray or projectiles (ANSI/ISEA Z87.1) and is not a substitute for indirectly vented splash goggles. Goggles should always be worn when wearing a face shield. A welding helmet, on the other hand, is required to protect the eyes, face, and neck from flash burn, UV light, sparks, infrared light, or heat with certain types of welding.

ANSI/ISEA Mark Z87: Basic impact: Face shields shall be capable of resisting impact from a 25.4 mm (1 in.) diameter steel ball dropped from a height of 127 cm (50 in.).

ANSI/ISEA Mark Z87+: High impact: Face shield that can resist impact from a .25 inch (6.35mm) diameter steel ball traveling at a velocity of 300 feet per second (91.4 m/s).

What Are Current Contact Lens Recommendations?

Contact lenses CAN be worn during laboratory or field activities provided that the required eye protection for the activity is also worn.

- American Chemical Society (ACS), *Doing Things Safely, Safety for Introductory Chemistry Students*, 2010
Personal Protection
 - “*In the chemistry laboratory*, wear eye protection (chemical safety goggles)! This applies at all times to all persons in the laboratory—even guests. Contact lenses worn with goggles are acceptable, but *in the chemical laboratory*, safety glasses and prescription safety glasses without goggles do not provide adequate protection. Increase the degree of protection (use face shields, laboratory hoods, etc.) when the hazards increase.”
- National Institute for Occupational Safety and Health (NIOSH), *Current Intelligence Bulletin 59 – Contact Use in the Chemical Environment*, 2005
Contact lenses can be worn in the laboratory provided that the required eye protection for the laboratory activity is worn.

“...NIOSH recommends that contact lens wear be permitted provided that the safety guidelines presented in this Current Intelligence Bulletin (CIB) are followed.” (p. iv)

“Employers need to:

Provide suitable eye and face protection for all workers exposed to eye injury hazards, regardless of contact lens wear.” (p. 3)

NOTE: *Current Intelligence Bulletin 59* recommends workers (*students*) be permitted to wear contact lenses provided that the safety guidelines are followed. The recommendations and guidelines are listed on pages 2 and 3 of the [Current Intelligence Bulletin 59](#).

How Should I Clean and Sanitize Eyewear?

After each use, protective eyewear—including indirectly vented, chemical-splash goggles and safety glasses that are shared—must be cleaned after exposure to chemical (e.g., corrosive residue) and physical (e.g., dirt or grime) materials. If exposed to biological material (disease-causing viruses and microbes), they must be sanitized or disinfected.

Eyewear can be sanitized or disinfected with soap, chemicals (i.e., chlorine or alcohol), or UV light. Goggles and straps can be washed in warm water and dishwashing detergent, rinsed thoroughly, and allowed to dry before the next use. Sanitizing uses a mild solution such as 2 teaspoons of bleach per 1 gallon of water. A stronger solution for disinfecting (using ½ tablespoon of bleach per pint of water) is typically recommended to destroy all of the organisms within 10 minutes. Manufacturer recommendations should be consulted before cleaning goggles.

A UV sanitizer uses a minimum of five minutes to kill 99% of the bacteria to sanitize, not disinfect eyewear. To prevent eye damage, a safety mechanism must automatically shut off the UV light source should one of the doors be accidentally opened. Please note that the UV sanitizer does not remove chemicals, dirt, or debris.

Sources:

[Sanitizing Dishes Using Bleach](#)

[Appendix A: Regulatory Framework for Disinfectants and Sterilants](#)

Where Can I Find More Information?

1. [American National Standards Institute/International Safety Equipment Association](#)

ANSI/ISEA Z87.1-2010, Section 10.1, p. 26

10.1 General

Eye and face protection shall be required where there is a reasonable probability of injury that can be prevented by such equipment. In such cases, employers and educational authorities shall make conveniently available a protector for the work environment, per applicable federal and state regulations. Employees and students shall use such protectors.

10.6 Training

Employers and educational authorities shall train employees and students in the proper use, application, inspection, maintenance, storage, fitting, and limitations of eye and face protectors.

[ANSI/ISEA Z87.1-2015](#)

[ANSI Z 136.1 Safe Use of Lasers](#)

The Science Teacher. [Shining a Light on Laser Safety](#). National Science Teachers Association (2014)

2. [Occupational Safety and Health Administration OSHA 29 CFR 1910.1450 \(Laboratory Standard\) Appendix A, D 6 \(a\) \(158-161\)](#)

School laboratories should include “protective apparel compatible with the required degree of protection for substances being handled.”

3. [Occupational Safety and Health Administration OSHA 1910.133 \(a\) \(1\), Eye and Face Protection](#)

“The employer shall insure that each affected employee uses appropriate eye and face protection when exposed to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation...”

4. American Chemical Society (ACS), [Guidelines for Chemical Laboratory Safety in Secondary Schools, 2016](#)

“Students and teachers must wear the appropriate personal protective equipment (PPE) and clothing. The basic requirements are listed here: a) Chemical splash goggles are an absolute requirement in all chemistry laboratories and should be worn at all times...”

5. [American Chemical Society, ACS Guidelines and Recommendations for the Teaching of High School Chemistry, 2012, page 17](#)

“All laboratories should contain the following safety equipment:

-Chemical Splash Goggles (American National Standards Institute, ANSI Z87.1) and a sanitizing cabinet”

6. [U.S. Consumer Product Safety Commission: Center for Disease Control and Prevention, National Institute for Occupational Safety and Health, School Chemistry Laboratory Safety Guide. \(2006\), page 7](#)

“Always wear appropriate eye protection (i.e., indirectly vented chemical splash goggles)”

7. [Investigating Safely – A Guide for High School Teachers. National Science Teachers Association.](#)

“ANSI Z87.1 compliant chemical indirectly vented splash goggles are the type of goggles that we strongly recommend you use EXCLUSIVELY.”

NSTA would like to thank its Science Safety Advisory Board for developing this resource. Questions or comments about its content should be directed to NSTA at 703-243-7100 or safety@nsta.org.

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